

TITLE OF INVENTION

Programmable Financial Instruments

CROSS REFERENCE TO RELATED APPLICATION

This application claims benefit of U.S. Provisional Patent Application No. 60/432,851, filed December 12, 2002, which is hereby incorporated by reference.

BACKGROUND OF THE INVENTION

Historically, financial instruments have been associated with pieces of paper or other tangible tokens of their existence, ownership, and other terms and conditions. Sometimes financial instruments are represented by said tangible tokens; in other instances, the financial instruments are embodied by (or identified with) said tangible tokens.

With the development of sophisticated computer and communications technology, the concept of financial instrument has migrated (along with much else) into the virtual world of digital data. While this migration has (in the parlance of Wall Street) "dematerialized" stock certificates, it has not altered their status as objects. Securities (and other financial instruments) are represented or embodied by things that are moved about by people and their agents. More and more often, the agents are computer programs and the representations/embodiments are bits of data. The result has been a great increase in the speed, distance, and volume of transactions.

We shall refer to financial instruments that may be represented (or embodied) by paper or bits of data as data-based financial instruments (DFIs). DFIs are enormously useful, enabling global commerce and facilitating wealth creation. Nonetheless, commerce is not always best facilitated by DFIs.

There are several contexts in which it would be useful to have a different type of financial instrument that extends the concept of financial instrument beyond representation/embodiment as data to representation/embodiment as program. As explained in the sections that follow, these contexts include:

- Securities Trading
- Portfolio Management
- Collateral Management
- Securitization
- Securities Lending
- Risk Management
- Credit Enhancement
- General Commerce

PFIs may be used instead of DFIs wherever their greater flexibility and adaptability adds value.

BRIEF SUMMARY OF THE INVENTION

We may define a **programmable financial instrument** (“PFI”) as a financial instrument represented (or embodied) by an active software/system component or module which may be linked to one or more physical devices. Said component or module may reside or otherwise be associated with computer and related hardware which may include (without limitation) electronic computers, optical computers, biological computers, or quantum computers capable of operating with qubits and entangled states.

A PFI may be represented abstractly as

$P(x_1, \dots, x_n)$, where x_1, \dots, x_n are inputs and/or state variables of program P.

In a preferred embodiment, a PFI may be implemented as an internet/web agent, i.e., as a persistent, active software/system component with the capacity to communicate, perceive, reason, and act within its environment. The environment of said PFI may

include one or more computer and/or communications networks including public networks, private networks, and the internet. Said environment may also include the physical environment of one or more physical devices to which said PFI may be linked. Said PFI may interact with other internet/web agents and with other physical devices.

In an alternative preferred embodiment, a PFI may be implemented as a physical device subject to influence by an active software/system component or module and the physical environment. Said PFI may interact with other physical devices and preferably with internet/web agents.

BRIEF DESCRIPTION OF THE DRAWINGS

The above summary of the invention will be better understood when taken in conjunction with the following detailed description and accompanying drawings in which:

Figure 1 is a flow chart of a preferred embodiment of the operation and use of the invention for trading and portfolio management;

Figure 2 is a flow chart of a preferred embodiment of the operation and use of the invention for auto-collateralization;

Figure 3 is a flow chart of a preferred embodiment of the operation and use of the invention for auto-securitization;

Figure 4 is a flow chart of a preferred embodiment of the operation and use of the invention for auto-securities-lending;

Figure 5 is a flow chart of a preferred embodiment of the operation and use of the invention for auto-securities-borrowing;

Figure 6 is a flow chart of a preferred embodiment of the operation and use of the invention for auto-credit-enhancement.

DETAILED DESCRIPTION OF THE INVENTION

Financial markets are constantly striving to reduce the costs and complexity of their operations. One constraint on financial market efficiency stems from the nature of all existing financial instruments. They are inert objects, and do not exhibit adaptive behavior. Recent innovations in financial engineering have led to objects whose valuation can be a matter of considerable complexity (“exotic derivatives”). Nevertheless, even said exotic derivatives are inert. They cannot trade with other derivatives, nor can they perform valuation, risk management, or regulatory functions. If derivatives (and other financial instruments) can be made smarter, financial markets will become fairer, safer, and more efficient.

A method and system is disclosed for creating programmable financial instruments. The method and system addresses the problems caused by limiting the scope of financial instruments to inert objects, whether considered as abstract data or in a physical embodiment such as a paper certificate. Applications of the method and system include trading, portfolio management, collateralization, securitization, securities lending, securities borrowing, and credit enhancement.

A preferred embodiment for operation and use of the invention for trading and portfolio management is now described in connection with Fig. 1.

As shown in Fig. 1, step 1, PFIs which may preferably be programmable internet/web agents (preferably linked to physical devices) scour one or more computer networks (and preferably other virtual environments and/or physical environments) for counterparties. In step 2, said PFIs may link up with one or more other PFIs to create one or more pools of PFIs (“PPFI”). In step 3, said PFIs and/or PPPIs may negotiate with other web agents (and preferably virtual and/or physical devices) to trade one or more PFIs and/or DFIs. In

step 4, said PFIs may preferably perform market analysis, risk management, and/or record-keeping functions and/or communicate transactional and/or other information to other agents or facilities. Transactions may result in changes to the internal state of one or more said PFIs or to changes in the ownership and/or custody arrangements of one or more PFIs and/or DFIs. Other web agents (and preferably virtual and/or physical devices) representing and/or embodying actual or potential buyers, sellers, or third parties such as regulators and/or service providers, may negotiate and transact with said PFIs and/or PPFIs.

In an alternative preferred embodiment for operation and use of the invention for trading and portfolio management, PFIs may be physical devices subject to influence by an active software/system component or module and the physical environment. Said PFIs may scour said environment (and preferably computer/communications networks) for counterparty physical devices (and preferably web agents). Said PFIs may link up with other PFIs to create one or more pools of PFIs ("PPFI"). Said PFIs and/or PPFIs may negotiate with other physical devices (and preferably web agents) to trade one or more PFIs or DFIs. Said PFIs may preferably perform market analysis, risk management, and/or record-keeping functions and/or communicate transactional and/or other information to other agents or facilities. Transactions may result in changes to the internal state of one or more said PFIs or to changes in the ownership and/or custody arrangements of one or more DFIs. Other physical devices (and preferably web agents), representing actual or potential buyers, sellers, or third parties such as regulators and/or service providers, may negotiate and transact with said PFIs and/or PPFIs.

[Note: Both of the above-described preferred embodiments create PFIs that may assemble themselves into portfolios on behalf of their owners, fiduciaries, or agents thereof, allowing the PFIs to help manage portfolios, trade, analyze markets, manage risk, keep records—subject to constraints imposed by the program, other agents, and the environment. The inclusion of physical devices allows human traders, analysts, risk

managers, portfolio managers, and others to enter and interact in this environment with human and computer counterparts all over the world—both in physical and virtual space.]

A preferred embodiment for operation and use of the invention for auto-collateralization is now described in connection with Fig. 2.

As shown in Fig. 2, step 1, PFIs which may preferably be programmable internet/web agents (preferably linked to physical devices) scour one or more computer networks (and preferably other virtual environments and/or physical environments) for counterparties.

In step 2, said PFIs may link up with one or more other PFIs to create one or more pools of PFIs (“PPFI”). In step 3, said PFIs and/or PPFIs may negotiate with other web agents (and preferably virtual and/or physical devices) to form one or more new PFIs and/or DFIs collateralized by said PFIs, PPFIs, and/or DFIs. In step 4, said PFIs may preferably perform market analysis, risk management, and/or record-keeping functions and/or communicate transactional and/or other information to other agents or facilities.

Transactions may result in changes to the internal state of one or more said PFIs or to changes in the ownership and/or custody arrangements of one or more PFIs and/or DFIs. Other web agents (and preferably virtual and/or physical devices) representing and/or embodying actual or potential buyers, sellers, or third parties such as regulators and/or service providers, may negotiate and transact with said PFIs and/or PPFIs.

In an alternative preferred embodiment, PFIs may be physical devices subject to influence by an active software/system component or module and the physical environment. Said PFIs may scour said environment (and preferably computer/communications networks) for counterparty devices (and preferably web agents). Said PFIs may link up with other PFIs to create one or more pools of PFIs (“PPFI”). Said PFIs and/or PPFIs may negotiate with other physical devices (and preferably web agents) to form one or more new PFIs collateralized by said PFIs and/or PPFIs. Other physical devices (and preferably web agents), representing actual or

potential buyers, sellers, or third parties such as regulators and/or service providers, may negotiate and transact with said PFIs and/or PPFIs.

[Note: Both of the above-described preferred embodiments create PFIs that may assemble themselves into portfolios on behalf of their owners, fiduciaries, or agents thereof, allowing the PFIs to help manage collateralized portfolios, trade, analyze markets, manage risk, keep records—subject to constraints imposed by the program, other agents, and the environment. The inclusion of physical devices allows human traders, analysts, risk managers, portfolio managers, and others to enter and interact in this environment with human and computer counterparts all over the world—both in physical and virtual space.]

A preferred embodiment for operation and use of the invention for auto-securitization is now described in connection with Fig. 3.

As shown in Fig. 3, step 1, PFIs which may preferably be programmable internet/web agents (preferably linked to physical devices) scour one or more computer networks (and preferably other virtual environments and/or physical environments) for counterparties. In step 2, said PFIs may link up with other PFIs to create one or more asset pools of PFIs (“APFI”). In step 3, said PFIs and/or APFIs may negotiate with other web agents (and preferably virtual and/or physical devices) to form one or more new PFIs, APFIs, and/or DFIs securitized by said PFIs and/or APFIs. Other web agents (and preferably physical devices) representing actual or potential buyers, sellers, or third parties such as regulators and/or service providers, may negotiate and transact with said PFIs and/or APFIs. In step 4, said PFIs may preferably perform market analysis, risk management, and/or record-keeping functions and/or communicate transactional and/or other information to other agents or facilities. Transactions may result in changes to the internal state of one or more said PFIs or to changes in the ownership and/or custody arrangements of one or more PFIs and/or DFIs. Other web agents (and preferably virtual and/or physical devices)

representing and/or embodying actual or potential buyers, sellers, or third parties such as regulators and/or service providers, may negotiate and transact with said PFIs and/or PPFIs.

In an alternative preferred embodiment, PFIs may be physical devices subject to influence by an active software/system component or module and the physical environment. Said PFIs may link up with other PFIs to create one or more asset pools of PFIs (“APFI”). Said PFIs and/or APFIs may negotiate with other web agents (and preferably physical devices) to form one or more new PFIs securitized by said PFIs and/or APFIs. Other web agents (and preferably physical devices) representing actual or potential buyers, sellers, or third parties such as regulators and/or service providers, may negotiate and transact with said PFIs and/or APFIs.

[Note: Both of the above-described preferred embodiments create PFIs that may assemble themselves into portfolios on behalf of their owners, fiduciaries, or agents thereof, allowing the PFIs to help manage securitized portfolios, trade, analyze markets, manage risk, keep records—subject to constraints imposed by the program, other agents, and the environment. The inclusion of physical devices allows human traders, analysts, risk managers, portfolio managers, and others to enter and interact in this environment with human and computer counterparts all over the world—both in physical and virtual space.]

A preferred embodiment for operation and use of the invention for auto-securities lending is now described in connection with Fig. 4.

As shown in Fig. 4, step 1, PFIs which may preferably be programmable internet/web agents (preferably linked to physical devices) scour one or more computer networks (and preferably other virtual environments and/or physical environments) for counterparties. In step 2, said PFIs may link up with other PFIs to create one or more lending pools of

PFI ("LPFI"). In step 3, said PFI and/or LPFI may negotiate with other web agents (and preferably virtual and/or physical devices) to form one or more new PFI, LPFI, and/or DFIs securitized by said PFI and/or LPFI. Other web agents (and preferably physical devices) representing actual or potential borrowers, lenders, or third parties such as regulators and/or service providers, may negotiate and transact with said PFI and/or LPFI. In step 4, said PFI may preferably perform market analysis, risk management, and/or record-keeping functions and/or communicate transactional and/or other information to other agents or facilities. Transactions may result in changes to the internal state of one or more said PFI or to changes in the ownership and/or custody arrangements of one or more PFI and/or DFIs. Other web agents (and preferably virtual and/or physical devices) representing and/or embodying actual or potential borrowers, lenders, or third parties such as regulators and/or service providers, may negotiate and transact with said PFI and/or LPFI.

In an alternative preferred embodiment, PFI may be physical devices subject to influence by an active software/system component or module and the physical environment. Said PFI may link up with other PFI to create one or more lending pools of PFI ("LPFI"). Said PFI and/or LPFI may negotiate with other web agents (and preferably physical devices) to form one or more new PFI securitized by said PFI and/or LPFI. Other web agents (and preferably physical devices) representing actual or potential borrowers, lenders, or third parties such as regulators and/or service providers, may negotiate and transact with said PFI and/or LPFI.

[Note: Both of the above-described preferred embodiments create PFI that may assemble themselves into portfolios on behalf of their owners, fiduciaries, or agents thereof, allowing the PFI to help manage portfolios, lend securities, recall securities that have been loaned, analyze markets, manage risk, keep records—subject to constraints imposed by the program, other agents, and the environment. The inclusion of physical devices allows human traders, analysts, risk managers, portfolio managers, and others to

enter and interact in this environment with human and computer counterparts all over the world—both in physical and virtual space.]

A preferred embodiment for operation and use of the invention for auto-securities borrowing is now described in connection with Fig. 5.

As shown in Fig. 5, step 1, PFIs which may preferably be programmable internet/web agents (preferably linked to physical devices) scour one or more computer networks (and preferably other virtual environments and/or physical environments) for counterparties. In step 2, said PFIs may link up with other PFIs to create one or more borrowing pools of PFIs (“BPFIs”). In step 3, said PFIs and/or BPFIs may negotiate with other web agents (and preferably virtual and/or physical devices) to form one or more new PFIs, BPFIs, and/or DFIs securitized by said PFIs and/or BPFIs. Other web agents (and preferably physical devices) representing actual or potential borrowers, lenders, or third parties such as regulators and/or service providers, may negotiate and transact with said PFIs and/or BPFIs. In step 4, said PFIs may preferably perform market analysis, risk management, and/or record-keeping functions and/or communicate transactional and/or other information to other agents or facilities. Transactions may result in changes to the internal state of one or more said PFIs or to changes in the ownership and/or custody arrangements of one or more PFIs and/or DFIs. Other web agents (and preferably virtual and/or physical devices) representing and/or embodying actual or potential borrowers, lenders, or third parties such as regulators and/or service providers, may negotiate and transact with said PFIs and/or PPFIs.

In an alternative preferred embodiment, PFIs may be physical devices subject to influence by an active software/system component or module and the physical environment. Said PFIs may link up with other PFIs to create one or more borrowing pools of PFIs (“BPFIs”). Said PFIs and/or BPFIs may negotiate with other web agents (and preferably physical devices) to form one or more new PFIs securitized by said PFIs

and/or BPFIs. Other web agents (and preferably physical devices) representing actual or potential borrowers, lenders, or third parties such as regulators and/or service providers, may negotiate and transact with said PFIs and/or BPFIs.

[Note: Both of the above-described preferred embodiments create PFIs that may assemble themselves into portfolios on behalf of their owners, fiduciaries, or agents thereof, allowing the PFIs to help manage portfolios, borrow securities, return securities to a lender, analyze markets, manage risk, keep records—subject to constraints imposed by the program, other agents, and the environment. The inclusion of physical devices allows human traders, analysts, risk managers, portfolio managers, and others to enter and interact in this environment with human and computer counterparts all over the world—both in physical and virtual space.]

A preferred embodiment for operation and use of the invention for auto-credit-enhancement is now described in connection with Fig. 6.

As shown in Fig. 6, step 1, PFIs which may preferably be programmable internet/web agents (preferably linked to physical devices) scour one or more computer networks (and preferably other virtual environments and/or physical environments) for counterparties. In step 2, said PFIs may link up with other PFIs to create one or more credit enhancement PFIs (“CPFIs”). In step 3, said PFIs and/or CPFIs may negotiate with other web agents (and preferably virtual and/or physical devices) to form one or more new PFIs, CPFIs, and/or DFIs securitized by said PFIs and/or CPFIs. Other web agents (and preferably physical devices) representing actual or potential borrowers, lenders, or third parties such as regulators and/or service providers, may negotiate and transact with said PFIs and/or CPFIs. Said PFIs and/or CPFIs may facilitate credit enhancement by establishing escrow accounts for borrowers. Said escrow accounts may hold a portion of the nominal interest charged to the borrower. Said interest may be credited back to the borrower according to a set of rules which may be coded into the PFI. In a preferred embodiment, the PFI could

extend a single interest rate to all borrowers, with different amounts (preferably reflecting a borrower's credit rating) held in escrow and preferably eligible for crediting back to the borrower. Said escrow accounts may be coded into one or more PFIs, and may be invested according to rules coded into one or more PFIs. In step 4, said PFIs may preferably perform market analysis, risk management, and/or record-keeping functions and/or communicate transactional and/or other information to other agents or facilities. Transactions may result in changes to the internal state of one or more said PFIs or to changes in the ownership and/or custody arrangements of one or more PFIs and/or DFIs. Other web agents (and preferably virtual and/or physical devices) representing and/or embodying actual or potential borrowers, lenders, or third parties such as regulators and/or service providers, may negotiate and transact with said PFIs and/or CPFIs.

In an alternative preferred embodiment, PFIs may be physical devices subject to influence by an active software/system component or module and the physical environment. Said PFIs may link up with other PFIs to create one or more credit enhancement PFIs ("CPFIs"). Said PFIs and/or CPFIs may negotiate with other web agents (and preferably physical devices) to form one or more new PFIs securitized by said PFIs and/or CPFIs. Other web agents (and preferably physical devices) representing actual or potential borrowers, lenders, or third parties such as regulators and/or service providers, may negotiate and transact with said PFIs and/or CPFIs.

Said PFIs and/or CPFIs may facilitate credit enhancement by establishing escrow accounts for credit impaired borrowers. Said escrow accounts may hold a portion of the nominal interest charged to the borrower. Said interest may be credited back to the borrower according to a set of rules which may be coded into the PFI. In a preferred embodiment, the PFI could extend a single interest rate to all borrowers, with different amounts held in escrow and eligible for crediting back to the borrower. Said escrow

accounts may be coded into one or more PFIs, and may be invested according to rules coded into one or more PFIs.

[Note: Both of the above-described preferred embodiments create PFIs that may assemble themselves into portfolios on behalf of their owners, fiduciaries, or agents thereof, allowing the PFIs to help manage credit portfolios, trade, establish escrow accounts, perform credit analysis, analyze markets, manage risk, keep records—subject to constraints imposed by the program, other agents, and the environment. The inclusion of physical devices allows human traders, credit analysts, risk managers, portfolio managers, and others to enter and interact in this environment with human and computer counterparts all over the world—both in physical and virtual space.]